

LLNL Triennial Climate Scientific Focus Area Review

LLNL SFA Program Areas Overview

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David C. Bader

LLNL Climate Program Leader

Lawrence Livermore National Laboratory



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LLNL Scientific Focus Area Strategy envisions an integrated science program with three complementary and interacting components

- **The Program for Climate Model Diagnosis and Intercomparison** re-dedicates itself to its founding purpose of international leadership in the science of multi-model analysis through the exploitation of the rich Coupled Model Intercomparison Project Phase 3 and 5 (CMIP3 and CMIP5) multi-model databases that it established.
- **The Cloud, Aerosol and Chemistry Research** component will continue LLNL excellence in process research, parameterization development and model evaluation to contribute to the development of next-generation climate and Earth system models.
- Through **the Analytics, Informatics, and Management Systems** component, LLNL aims to bridge the “valley of death” between computational science research and its application to climate research and the fusion of modeling with measurement.

SFA project structure and emphasis were guided by three overarching principles that demonstrate LLNL leadership.

- **Scientific excellence in all of our work**
 - **Staff** – *Recruitment, development and support for scientists and engineers through all career stages*
 - **Results** – *High-impact publications that address the most challenging problems*
- **Relevance to the most pressing problems in climate science**
 - **U.S. Global Change Research Program (USGCRP) and National Research Council (NRC)** planning documents and reports
 - **DOE mission as reflected in the Climate and Environmental Sciences Division (CESD)** strategic plan
- **Collaboration**
 - **Internally** *through a cooperative and team oriented approach to research*
 - **Within the DOE National Laboratory system** *through integrated, multi-laboratory efforts supported by CESD*
 - **Nationally** *through joint research and publications with leading scientists in the field*
 - **Internationally** *through World Climate Research Programme (WCRP) committees, working groups and panels*

Ben Santer of LLNL was honored by National Academy of Sciences and American Geophysical Union for his pioneering research and sustained contributions to climate change



Elected a member of the National Academy of Sciences in recognition of his distinguished and continuing achievements in original research.

Elected a Fellow of the American Geophysical Union for his research on human-induced climate change



LLNL Excellence in Science Leadership is widely recognized

Dean Williams



- **2008 *Science Spectrum* Minorities in Research and Science, Senior Investigator Emerald Award** for consistent leadership in advancing basic science knowledge or discovering, developing, and implementing entirely new technologies.

Steve Klein



- **2012 AGU Atmospheric Sciences Section's Ascent Award** recognizing Steve's research "elucidating the role of clouds in climate change and the fidelity with which climate models simulate clouds."

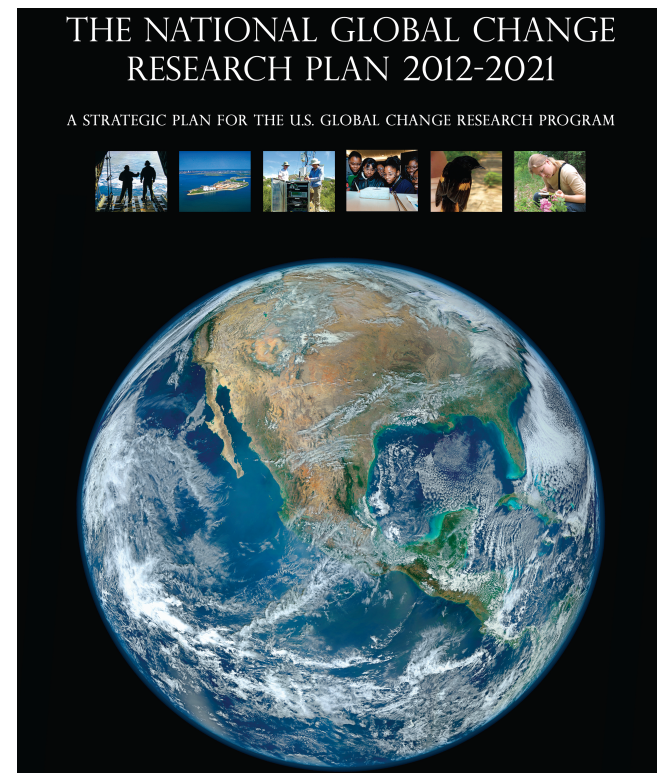
Excellence continues with next generation of scientists

Céline Bonfils, is a 2012 recipient of an Office of Science Early Career Research Program Award. Bonfils was selected by the Office of Biological and Environmental Research for the project “Detection and Attribution of Regional Climate Change with a Focus on the Precursors of Droughts.”



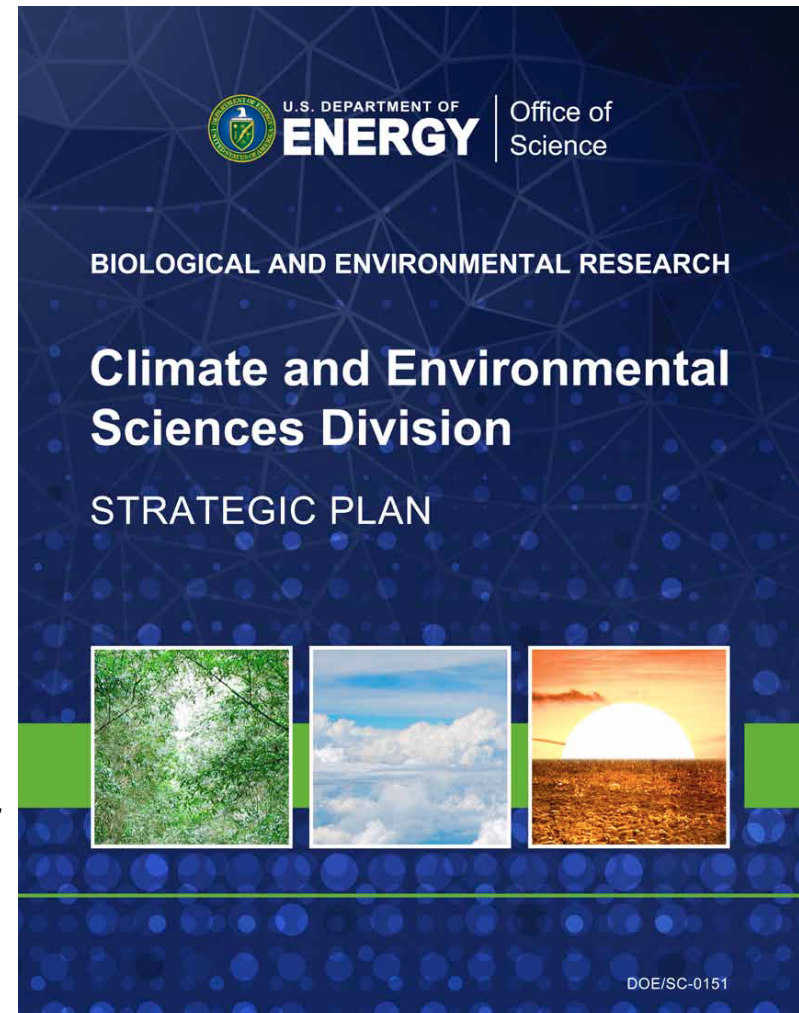
LLNL Climate SFA Research Motivation: Needs expressed in the USGCRP Strategic Plan

- **Objective 1.4: Integrated Modeling** *Improve and develop advanced models that integrate across the **physical, chemical**, biological, and human components of the Earth system, including the **feedbacks** among them, to represent more comprehensively and predict more realistically global change processes (PCMDI; CAC)*
- **Objective 1.5: Information Management and Sharing** - *Advance the capability to collect, store, access, visualize, and share data and information about the integrated Earth system, the vulnerabilities of integrated human-natural systems to global change, and the responses to these vulnerabilities (AIMS)*



LLNL Climate SFA Research Motivation: Needs expressed in the CESD Strategic Plan

- **Goal 1: Synthesize new process knowledge and innovative computational methods advancing next-generation, integrated models of the human- Earth system.**
 - *To accomplish this goal, CESD will provide key insights into multi-scale, complex dynamics and system behavior using newly developed knowledge including **climate variability and change**, carbon and **water cycles, clouds and aerosols**, oceans, terrestrial, cryosphere, and human systems impacts and feedbacks.*
 - **Vision:** *To develop community-based, integrated human-Earth system models, **exploring systems dynamics with improved process representations, while strengthening our predictive understanding of climate, its natural and anthropogenic influences, and its effects.***



LLNL Climate SFA Research Motivation: Needs expressed in the CESD Strategic Plan (continued)

- **Goal 4: Enhance the unique capabilities and impacts of the ARM and EMSL scientific user facilities and other BER community resources to advance the frontiers of climate and environmental science.**
 - *To accomplish this goal, CESD will deliver the leading scientific user facilities and **other mission-critical community resources**, including unique field research sites; environmental observational networks; **dedicated high-performance computational systems; a world-renowned climate model diagnostics center; visualization, analysis, and data dissemination capabilities**; and public data archives.*
 - **Vision:** *To use premier, best-in-class instrumentation; **tailored computational hardware and software; robust, accurate, and timely data sets**; and defined field sites for experimental studies to achieve unprecedented understanding of Earth's dynamic processes at the full range of scales.*

Leadership in collaboration recognized by an American Meteorological Society Special Award in 2010



*Bader, Covey and, Taylor
Not Pictured - Aquilino , Drach and
Williams*

“leadership in implementing, maintaining and facilitating access to the CMIP3 multi-model dataset archive, which led to a new era in climate system analysis and understanding.”

Agenda – Wednesday Overview Talks

- *Cloud, Aerosol, and Chemistry Process Research* - **Steve Klein**
- *The Program for Climate Model Diagnosis and Intercomparison* - **Karl Taylor**
- *Analytics, Informatics, and Management Systems* - **Dean Williams**

Agenda – Wednesday Topical Science Talks

- **Lunch Seminar:** *"Identifying Human Influences on Atmospheric Temperature: Are Results Robust to Uncertainties?"* - **Ben Santer**
- *"The Asian Summer Monsoon: An Intercomparison of CMIP5 vs. CMIP3 Simulations of the Late 20th Century"* – **Ken Sperber**
- *"Human-induced Global Ocean Warming on Multi-decadal Timescales"* - **Peter Gleckler**
- *"Improving Consistency between Cloud Parameterizations in Version 5 of the Community Atmosphere Model"* - **Peter Caldwell**
- *"Quantifying and Understanding Cloud Feedbacks, Rapid Adjustments, and Biases Using Cloud Radiative Kernels"* - **Mark Zelinka**

Agenda – Thursday Presentations

- ***Poster session with results from recent work***
- ***LLNL Climate Program Management and Organization -***
Dave Bader

Thank You!!!

**We appreciate that you have
made time for this review.
Your advice and comments
will be used to make us
better.**